

Acoustic microsystems

Number of ECTS credits: 3

Coefficient: 3

Description:

The content of the course should lead to the understanding, realization and characterization of Acoustic microsystems:

- Basics of wave physics
- Introduction to acoustic waves in fluids
- Introduction to elastic waves in solids (basic equations, tensor of elasticity, curves of slowness, reflection and refraction, etc.)
- Technological description and modeling of the main micro-acoustic devices (transducers, surface wave devices, acoustic MEMS)

The tutorials will be devoted to the analysis of existing Acoustic microsystems (SAW, MUT). Four labs will cover the design, realization and characterization of Acoustic microsystems:

1. Design of a surface elastic wave (SAW) device for RF filtering, mask drawing, photolithography
2. Electrical characterization of SAW devices under points and in boxes, optical characterization of vibration modes;
3. Analysis of the operation of a quartz tuning fork (measurement of the response and estimation of the main parameters), realization of an oscillating circuit
4. Production of a 3D model by finite elements of a quartz tuning fork (modal analysis, harmonic response).

Pedagogical objectives:

Understanding of the physics of acoustic and elastic waves, as well as of devices using them

Know how to estimate wave speeds, energy distribution and operating frequencies

Know how to make a simple acoustic microsystem and characterize it

Bibliography: Prerequisite:

Lectures Hours: 14

Tutorials Hours: 6

Labs Hours: 8

Knowledge monitoring modalities: 100% continuous assesement

Assesement: Reports of labs, exam

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